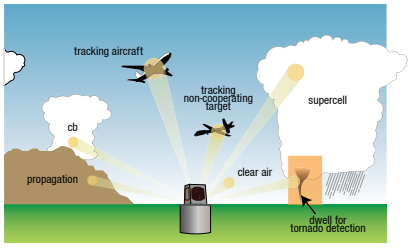
National Severe Storms Laboratory

The National Severe Storms Laboratory

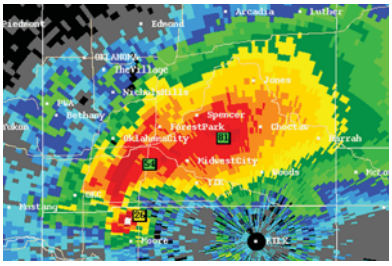
Studying devastating storms from the heart of “tornado alley”

The National Oceanic and Atmospheric Administration's National Severe Storms Laboratory leads the way in investigations of all aspects of severe and hazardous weather. In Norman, Oklahoma, the people of NSSL, in close partnership with the National Weather Service, are dedicated to improving the lead time and accuracy of severe weather warnings and forecasts in order to save lives and reduce property damage.

Severe weather research conducted at NSSL has led to substantial improvements in severe and hazardous weather forecasting resulting in increased warning lead times to the public. NSSL scientists are exploring new ways to improve our understanding of the causes of severe weather and ways to use weather information to assist National Weather Service forecasters, as well as federal, university and private sector partners.



Multi-mission phased array radar is part of the National Weather Radar Testbed in Norman, Oklahoma.



NWS forecasters track storms using radar technology developed at NSSL.

NSSL collaborated to build the SMART-Radar, a 5-cm mobile Doppler radar capable of scanning and penetrating an entire storm or hurricane.

Dual Polarization Radar

NSSL continues to be a pioneer in the development of weather radar. For many years, the lab has researched the use of dual polarization radar to improve precipitation measurements and hail identification. This scheduled upgrade to the current NEXRAD Doppler radar hardware provides more information about precipitation in clouds to better distinguish between rain, ice, hail and mixtures. Better information will help forecasters provide more accurate and timely warnings for flash floods, the number one severe weather threat to human life.

Phased Array Radar

NSSL researchers are adapting state-of-the-art radar technology currently deployed on Navy ships for military purposes to detecting severe weather. Phased array radar reduces the scan or data collection time from four or five minutes to less than one minute. This technology has the potential to increase the average lead time for tornado warnings well beyond the current average of 13 minutes. Other technology being developed at NSSL could extend lead times even further.

Warning Decision Support System II

NSSL is committed to incorporating cutting-edge scientific understanding of severe weather signatures into tools designed to help National Weather Service forecasters make better and faster warning decisions. The latest tool, NSSL’s Warning Decision Support System II, includes automated algorithm detection tools for the NEXRAD Doppler radar and other sensors to identify rotation in storms preceding tornadoes, likelihood and size of hail, as well as identifying and tracking storms. This information is presented in an easy-to-use display including tables, graphs and data interrogation tools. Several of these tools have already been integrated into the National Weather Service’s AWIPS system and have contributed to improved warning lead times with fewer false alarms.

NSSL studies all types and aspects of severe weather, including lightning and the electrical structure of thunderstorms.

Hydrometeorology

NSSL hydrometeorologic research serves society's needs for weather and water information by developing methods to monitor and predict floods and flash floods. Accurate quantitative precipitation estimates (QPE) and very short-term quantitative precipitation forecasts (VSQPF) are critical to fresh water management in the United States and around the world. The next generation QPE (Q2) continues NSSL's departure from radar-centric precipitation estimation and moves toward a multi-sensor approach focused on high-resolution integration of radar, satellite, model, and surface observations to produce very high-resolution precipitation estimates.

NEXRAD Upgrades

NSSL worked directly with the National Weather Service to complete significant upgrades to the NEXRAD WSR-88D Doppler radar. NSSL was responsible for the design and implementation of the system software architecture for both the Open Radar Product Generator (ORPG) and the Open Radar Data Acquisition (ORDA). The radar's software and hardware were redesigned using open systems concepts, providing a system that is now capable of growing and adapting to meet the ever-increasing demands of its users. The ORPG and ORDA redesign allows new science and technology to be transferred to NWS operations more quickly, while dramatically lowering maintenance and future upgrade costs.

Improving the State of the Science

For more than 40 years, scientists at NSSL have conducted field experiments to study severe and hazardous weather. The knowledge gained through these field programs will lead to improved forecasts of deadly weather phenomena. Researchers at NSSL are working on ways to improve short-term weather forecasting computer models for the National Weather Service, basic tornado research to understand how tornadoes form, and real-time delivery of radar data to the meteorological community and interested partners.

National Weather Center

NSSL, along with the National Weather Service, recently moved to the new National Weather Center, a $69 million 244,000-square-foot facility dedicated in September 2006. The NWC houses a unique confederation of NOAA, University of Oklahoma and state organizations that work together in a partnership to improve understanding of events occurring in Earth's atmosphere over a wide range of time and space scales. With about 550 people, the NWC includes research scientists, operational meteorologists and climatologists, engineers and technicians, support staff and graduate and undergraduate students.

Research Partnerships

NSSL has a research partnership with the Cooperative Institute for Mesoscale Meteorological Studies (CIMMS), a cooperative institute between the National Oceanic and Atmospheric Administration (NOAA) and the University of Oklahoma. Additionally, NSSL conducts collaborative research with the U.S. Navy, Air Force, Army, Department of Transportation, Federal Aviation Administration, Texas A&M, Texas Tech University and several large and small corporations.

Dr. James Kimpel, Director
Kevin Kelleher, Deputy Director
1/2007